

# Hatching and control of Australian plague locusts

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## Emergency Operations Unit

### What influences hatching dates?

Egg development and hatching is influenced by temperature and moisture conditions.

Eggs laid in spring and summer behave differently to eggs laid in autumn.

For eggs laid in autumn, their development slows as it gets colder. As temperatures drop below about 15°C, development is halted.

The majority of eggs laid in autumn during March and April go into a diapause phase where they remain dormant and only resume development in late winter.

Hatching occurs when embryos are fully developed, and days are warm enough to encourage them to climb to the surface. Once development is complete then hatching can commence in as little as a few days.

Because egg development is temperature controlled, locusts will hatch firstly in the north and west of the state.

### Diapause over winter

The diapause period of the locust egg suspends the development of the embryo when it is about 35% complete. It is an adaptation of the plague locust to survive cold winters.

The diapause period lasts about two months or more specifically, a period of nine weeks with a range either side of two weeks.

With increasing warmth and moisture, the development rate of the eggs will increase until

development is complete and the nymphs are then ready to emerge.

It is possible for eggs laid during May or even June to bypass diapause and develop slowly during winter.

### Dormancy in dry conditions

Any return to dry soil conditions prior to hatching can cause eggs to enter another dormant or 'quiescent' state. Rainfall will be required to end this dormant state and enable development to continue.

Once development is complete then hatching can commence in as little as two weeks after rainfall in spring.

### Can the predicted dates be taken literally?

No, these forecasts are modelled dates based on average temperatures. The predictions are a guide to when the bulk of the total population of nymphs will emerge from diapause eggs.

If temperatures are consistently above average in August/September, then hatchings will occur earlier than the forecast dates. Small falls of rain at that time are likely to accelerate the emergence of nymphs.

Be proactive and monitor known egg beds for early hatching.

## Will eggs all hatch at the same time for a given location?

No, not necessarily. There is always a range of hatching dates in a location. Typically, egg beds are laid at different times and in different soil types. They are also exposed to different temperature and moisture conditions that can cause staggered hatchings.

A milder and warmer winter than normal will bring forward hatching dates. Most areas with eggs will already have sufficient soil moisture to hatch in spring, but drying conditions can delay egg development. Any falls of rain of 15 mm or higher in August or September could accelerate the development of eggs and also the emergence of nymphs.

## Locust development

Eggs laid in spring and summer can complete their development and hatch in as little as two weeks. This requires temperatures around 35°C and wet conditions.

It takes about 20–25 days for locust nymphs to complete development in mid-summer.

As the ambient air temperature falls, egg development slows.

Plague locusts usually have five instars (growth stages) but may have six in dry or cold conditions (see Figure 3).

## What do they look like?

Young first instar nymphs are 3 mm long and generally whitish or pale. However, their colour can vary from pale brown to dark brown or black, with or without a white stripe along their first body segment just behind their head.

Figure 1: Locusts hatching and emerging from the soil.



Photo: Simon Oliver, NSW DPI

## Banding

Nymphs readily form into larger groups of locusts known as bands. The locusts coordinate their movement to march within the band and usually a distinct front develops which can range from a few metres up to several kilometres in length. Dense bands can often be seen from the air as darker lines and appear similar to a tidal mark on the seashore. These bands are very destructive and can consume everything they pass across.

## How long before the bands of locusts form?

Locust bands form around the 3rd instar stage (approximately 2–3 weeks after hatching).

Banding is the most effective and economic time to control locusts as they are grouped together in high densities, can be seen more easily and less chemical is required to be applied to the target.

## What happens when the locusts don't appear to be banding?

Sometimes, if the population of locusts is at different growth stages or there is plentiful food and shelter, they may not band.

If banding appears unlikely then the landholder will need to consider control decisions on a whole paddock or broad acre basis, after discussion with the Local Land Services.

Landholders should establish that the hoppers are at the mid instar growth stage (3–4) and banding is not hidden from view by the crop canopy.

Figure 2: Locusts banding in a pasture paddock.

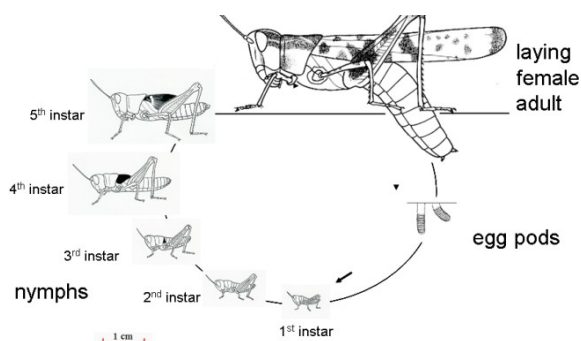


Photo: NSW DPI

## Adults

Fledging is the final moult to the winged adult. From egg laying to fledging usually takes 6–8 weeks. The adult locusts will now accumulate fat to fuel their migration. If conditions are dry at fledging, locusts do not accumulate fat or migrate or develop eggs.

Figure 3: Life cycle of the Australian plague locust.



Source: Modified from APLC by NSW DPI.

## Control methods

### What methods of control are available?

The registered chemicals for plague locust control, their labels, Safety Data Sheets and permits can all be accessed at the NSW Department of Primary Industries (NSW DPI) website at <https://www.dpi.nsw.gov.au/climate-and-emergencies/locusts/chemicals/msdss-and-labels>.

Chemical labels provide information on the recommended rates and situations for use.

### Is there a biological control available?

A naturally occurring soil fungus, *Metarhizium*, which is specific to locusts and grasshoppers, has been developed into an environmentally friendly control for locusts. It provides an alternative to chemicals and does not harm other organisms. It is marketed as Green Guard®.

Green Guard® has registration from the Australian Pesticides and Veterinary Medicines Authority (APVMA) and is available through agricultural resellers and Local Land Services (LLS). Before use, organic growers should check with their certifying body.

For more information on Green Guard®, formulations and use situations, refer to the [Primefact – Spraying locusts with \*Metarhizium\*](https://www.dpi.nsw.gov.au/climate-and-emergencies/emergency/locusts) on the NSW DPI website at <https://www.dpi.nsw.gov.au/climate-and-emergencies/emergency/locusts>.

### Will there be an aerial campaign to spray the plague locusts?

NSW control strategies continue to be primarily focused on landholder ground spraying of locusts. This is the most effective and efficient method of control.

Aerial control is a last resort and will only be considered when all ground control options have been exhausted. Aerial spraying is also subject to meeting strict environmental and operational requirements.

Terrain, environmental, occupational health and safety and other risk factors impose significant constraints, and opportunities for cost-effective aerial control are very limited. Label restrictions include buffer zones to all water sources, domestic dwellings, crops and other sensitive areas make aerial spraying difficult in many cases. A case by case risk assessment must be undertaken beforehand.

### What can I do to be better prepared?

Mark any egg beds on your property. Plan to set aside time for monitoring hatchings in spring. Plan a control strategy. Be in regular contact with your LLS.

### Landholder responsibilities

Under the *Biosecurity Act 2015* landholders and land managers have the responsibility to report the presence of plague locusts to their LLS and to control locusts on their land.

Chemical will be provided to LLS ratepayers by their LLS in NSW. All chemicals must be used according to the requirements of the *Pesticides Act 1999*, including recording of all pesticide applications.

### Chemical residues

Every chemical has a harvest withholding period (WHP). Consult the specific label for the withholding period. For windrowed crops, the windrow date is the same as the harvest date

when considering chemical control options and the associated harvest withholding period. In crops cut for hay, the harvest withholding period commences from their hay cut or windrow date.

The [Locusts, grasshoppers and livestock residues brochure](#) provides WHPs, export slaughter intervals (ESI) and export grazing intervals (EGI) for chemicals registered for locust control. The brochure can be downloaded from the Safe Meat website [www.safemeat.com.au](http://www.safemeat.com.au).

### More information

- NSW Department of Primary Industries - Locusts <https://www.dpi.nsw.gov.au/climate-and-emergencies/locusts>
- Australian Plague Locust Commission [www.agriculture.gov.au/pests-diseases-weeds/locusts](http://www.agriculture.gov.au/pests-diseases-weeds/locusts)
- Local Land Services [www.lls.nsw.gov.au](http://www.lls.nsw.gov.au)

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© State of New South Wales through Regional NSW 2020. The information contained in this publication is based on knowledge and understanding at the time of writing (December 2020). However, because of advances in knowledge, users are reminded of the need to ensure that the information upon which they rely is up to date and to check the currency of the information with the appropriate officer of the Department of Regional NSW or the user's independent adviser.